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APPLICATION NUMBER: *60/453,491*
FILING DATE: *March 11, 2003*
RELATED PCT APPLICATION NUMBER: *PCT/US04/07152*

By Authority of the
COMMISSIONER OF PATENTS AND TRADEMARKS

M. Tarver

M. TARVER
Certifying Officer

J1064 U.S. PTO
03/11/03

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PTO/SB/16 (02-01)
Approved for use through 10/31/2002. OMB 0651-0032
Patent and Trademark Office; U.S. DEPARTMENT OF COMMERCE

J1036 U.S. PTO
60/453491

PROVISIONAL APPLICATION FOR PATENT COVER SHEET

This is a request for filing a PROVISIONAL APPLICATION FOR PATENT under 37 CFR 1.53 (c).

Express Mail Label No. EV249512425 US

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TITLE OF THE INVENTION (280 characters max)

WHOLE-HOUSE VIDEO DISTRIBUTION SYSTEMS

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Direct all correspondence to:

☐ Customer Number [ ] → *Place Customer Number Bar Code Label here*

OR *Type Customer Number here*

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ENCLOSED APPLICATION PARTS *(check all that apply)*

☒ Specification *Number of Pages* 37 ☐ CD(s), Number

☐ Drawing(s) *Number of Sheets* ☐ Other (specify)

☐ Application Data Sheet. See 37 CFR 1.76

METHOD OF PAYMENT OF FILING FEES FOR THIS PROVISIONAL APPLICATION FOR PATENT *(check one)*

☐ Applicant claims small entity status. See 37 CFR 1.27.

☐ A check or money order is enclosed to cover the filing fees

☒ The Commissioner is hereby authorized to charge filing fees or credit any overpayment to Deposit Account Number: 07-0832

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The invention was made by an agency of the United States Government or under a contract with an agency of the United States Government.

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Respectfully submitted,
SIGNATURE [signature]

Date 3/11/03

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Docket Number: PU030072

USE ONLY FOR FILING A PROVISIONAL APPLICATION FOR PATENT

60453491.031103

PROVISIONAL APPLICATION COVER SHEET
Additional Page

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Number 1 of 1

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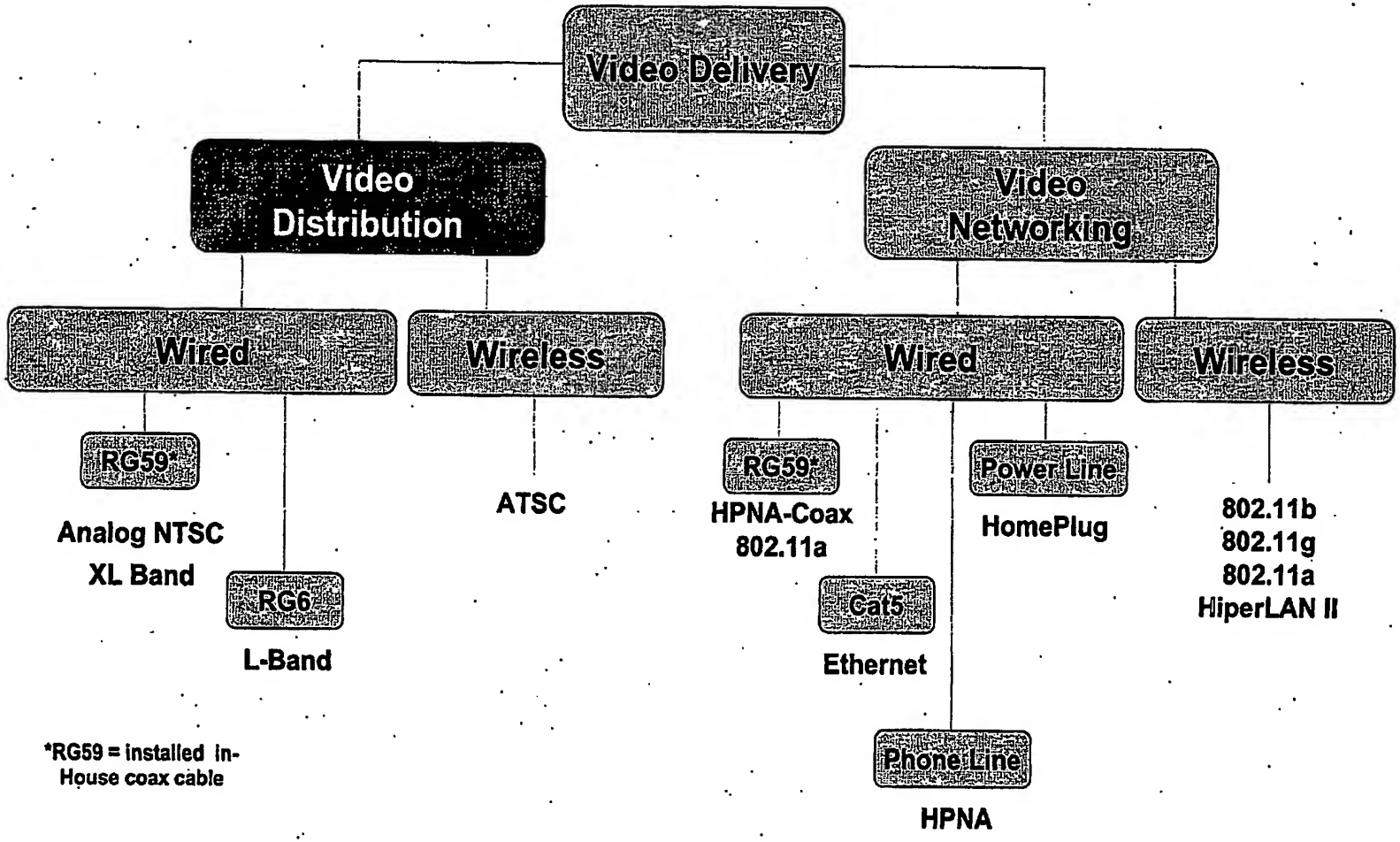
INNOVATION | PARTNERSHIP | SUCCESS

Whole-House Video Distribution Systems

60453491.031103

Video Delivery Classification



*RG59 = installed in-House coax cable

Video Distribution

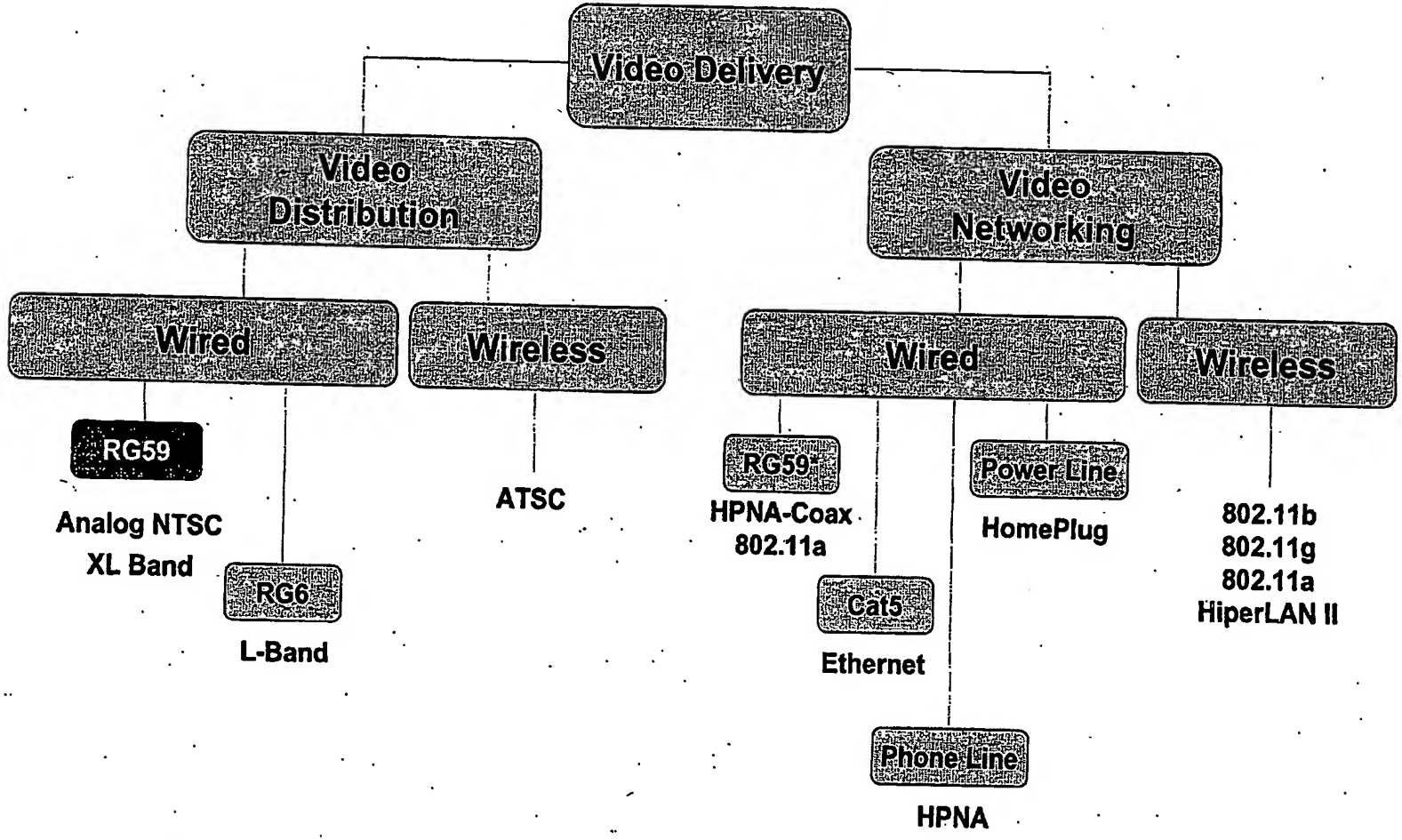
- Why use video distribution?
  - Provides robust video delivery
  - Low complexity/Stable
    - Relative to data networking technology, video distribution is much simpler and less prone to complex support issues
- When should you use video distribution?
  - Want to limit access to video service
    - Video distribution does have mechanism to "share" content with other networks (e.g., PC)
  - Low need for real time interactivity
    - If there is now corresponding data network, then video distribution is sufficient

Video Distribution Medium Choices

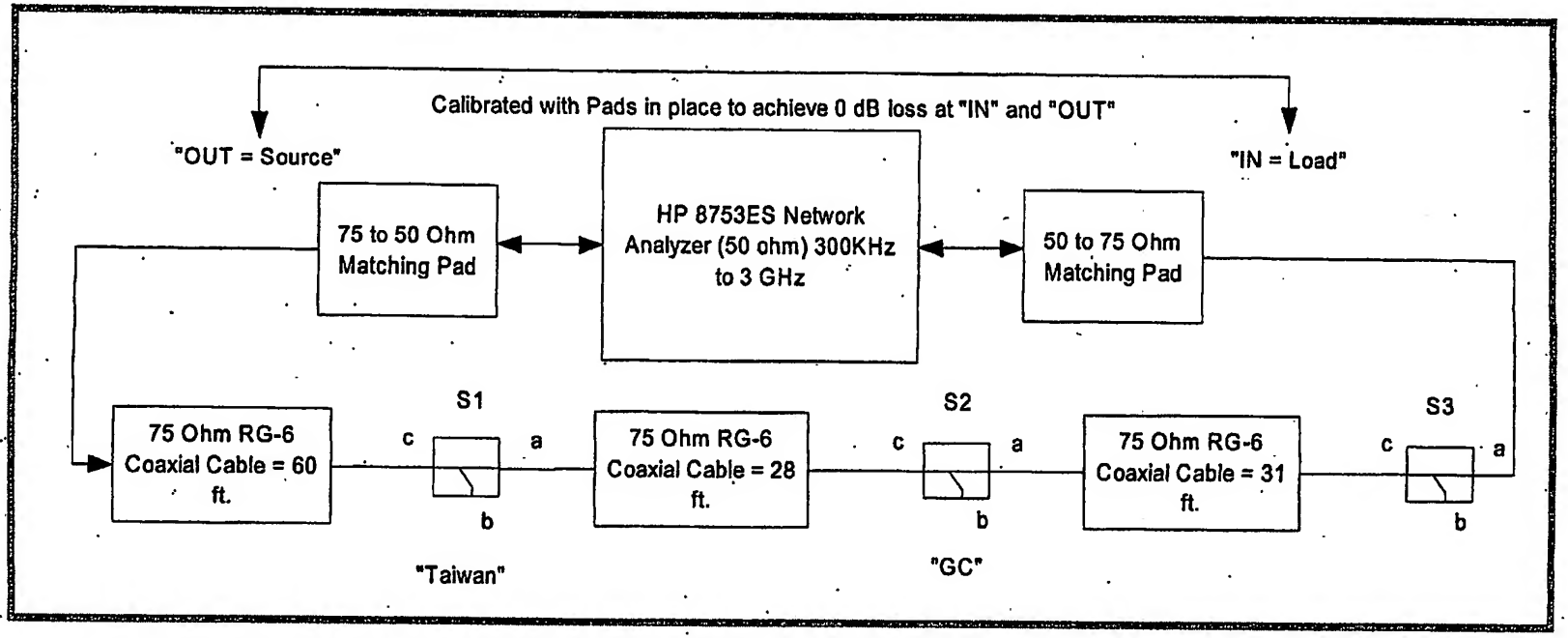
- Wireless: NTSC/ATSC not viable in home
- Wired RG6: Generally requires new cables…
- Wired RG59:
  - Prevalent cabling in home: 70% of homes get their video service from cable providers today using RG59
  - Installation savings (No New Wires)
    - RG59 is likely present where the customer wants video
  - Flexible
    - Analog applications provide lowest cost solutions
    - Digital applications support higher quality video
  - RG59 distribution creates competitive cost model to cable MSO installation costs

Existing RG59 cable may be exploited for installation and potent ially equipment cost savings for multi-room / whole-house installations

Video Distribution: Wired: RG59: Analog NTSC

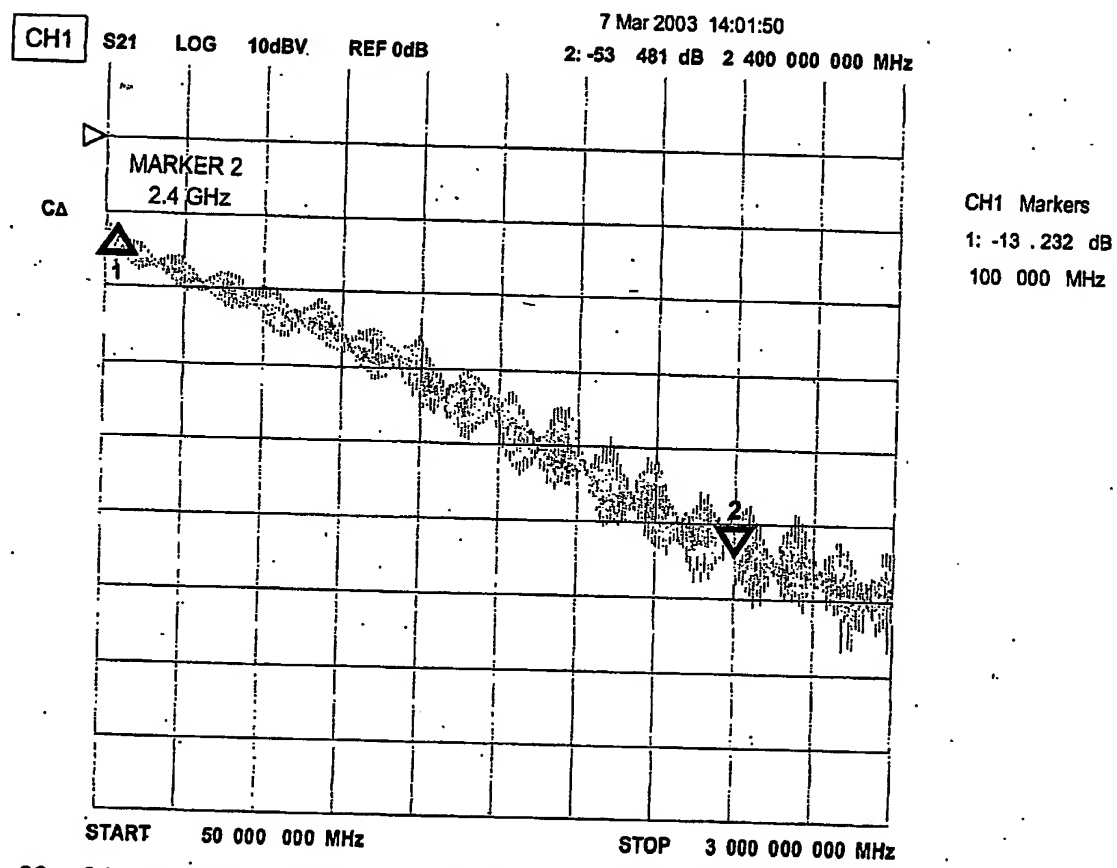


In-House Coaxial Cable Analysis: Downstream



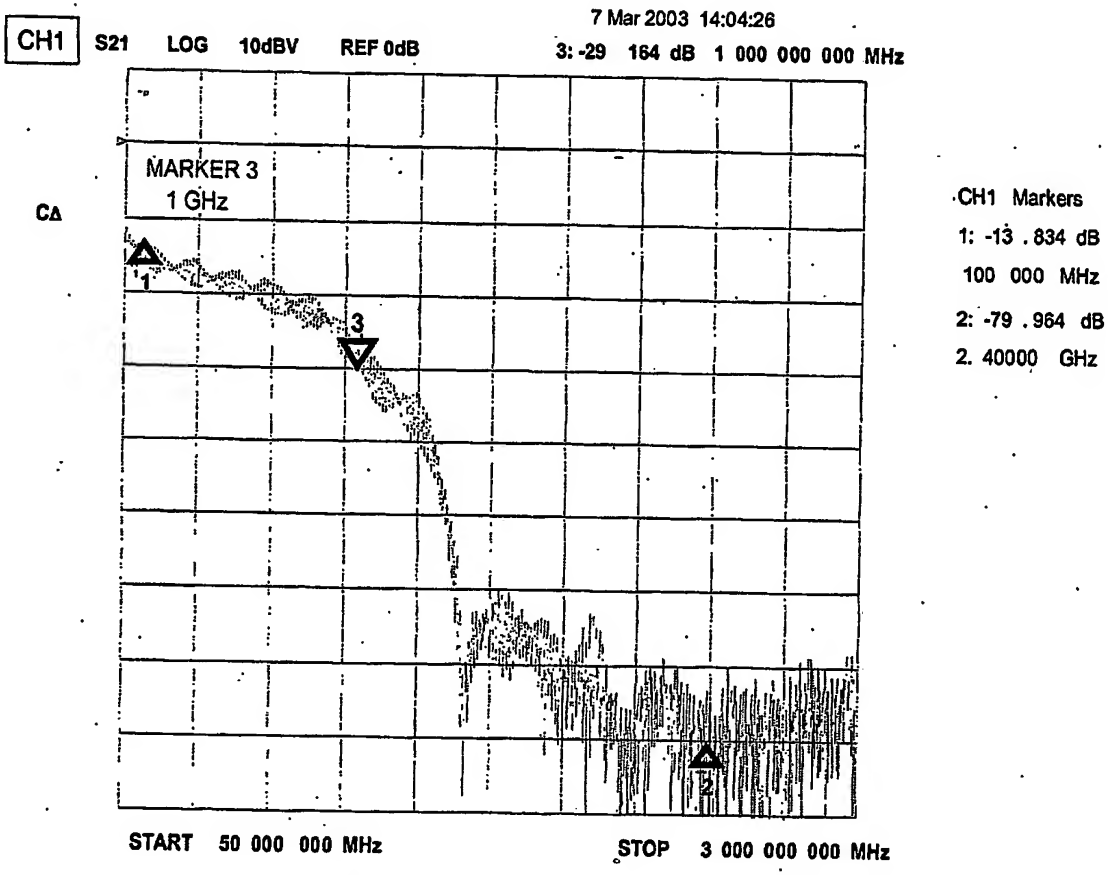
- Thomson testing configuration for in-home coax (home entry point to receiver)
  - 4 random splitters were characterized for frequency performance
  - 3 splitters were used in test
- RG6 was used rather than RG59 because of availability
  - RG59 performance will be worse by at least several dB

Downstream Loss vs. Frequency Test 1



Configuration: 60 + 31 + 28 Feet of RG-6 plus 4 "F" barrel connectors
Splitters: "Taiwan", "GC", "Solutions SL559"
Loss at 100MHz= -13.2 dB, Loss at 1GHz = -27dB, Loss at 2.4 GHz = -53.5 dB

Downstream Loss vs. Frequency Test 2

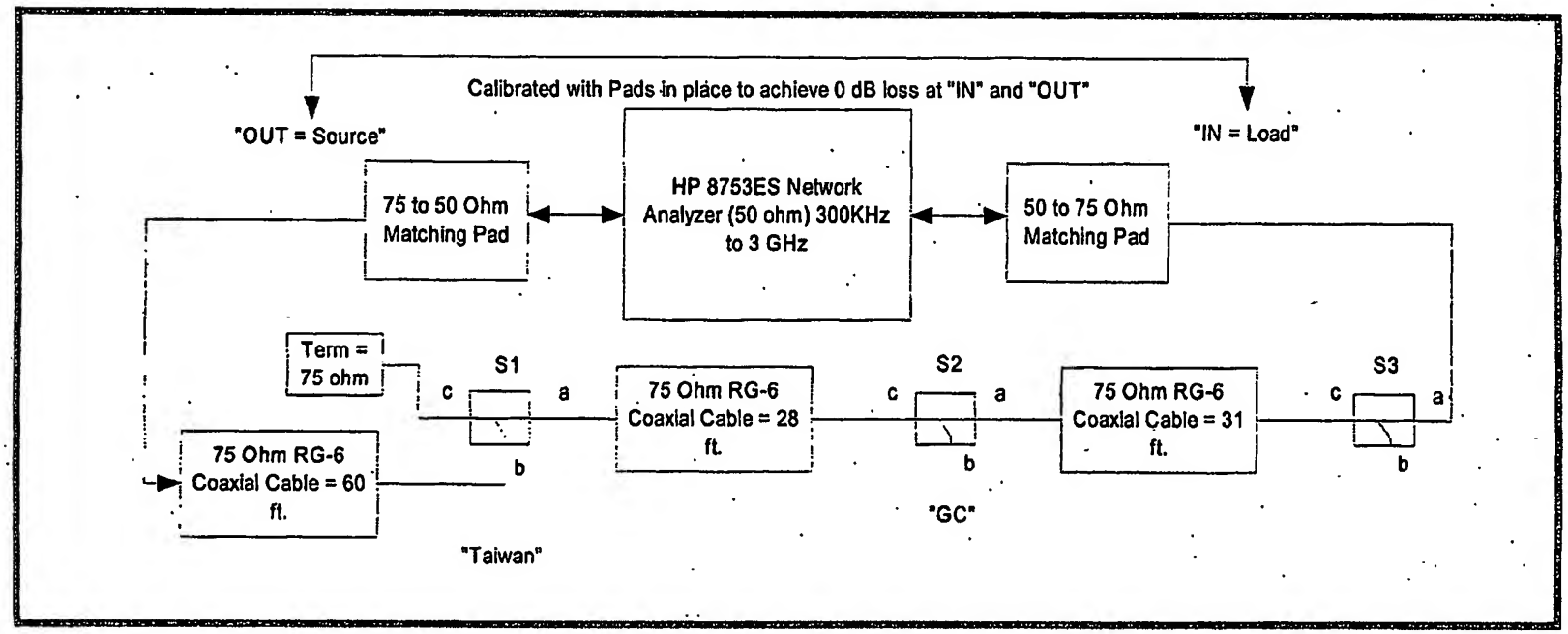


Configuration: 60 + 31 + 28 Feet of RG-6 plus 4 "F" barrel connectors

Splitters: "Taiwan", "GC", "Channel Master 7244"

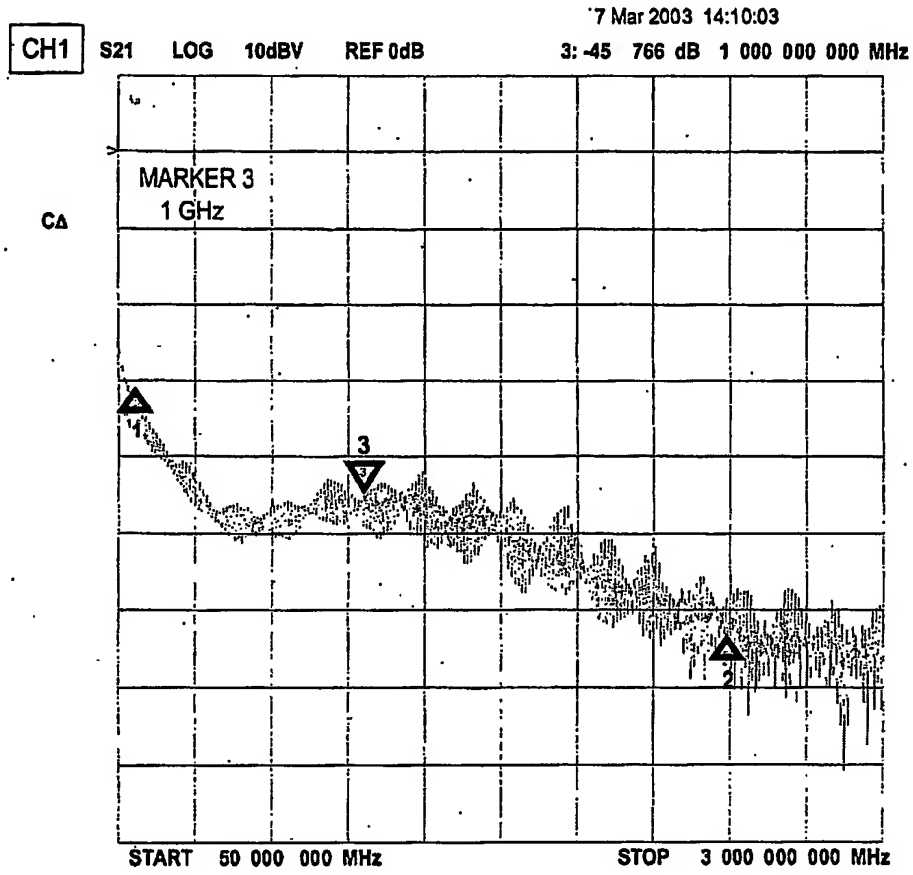
Loss at 100MHz= -13.8 dB, Loss at 1GHz = -29.1 dB, Loss at 2.4 GHz = -80.0 dB

In-House Coaxial Cable Analysis: Back Drive



- Objective: Determine impact of splitters and coaxial cable on video signal delivery
- Thomson testing configuration for in-home coax (back driving in-home coax network)
  - 4 random splitters were characterized for frequency performance
- RG6 was used rather than RG59 because of availability
  - RG59 performance will be worse by at least several dB

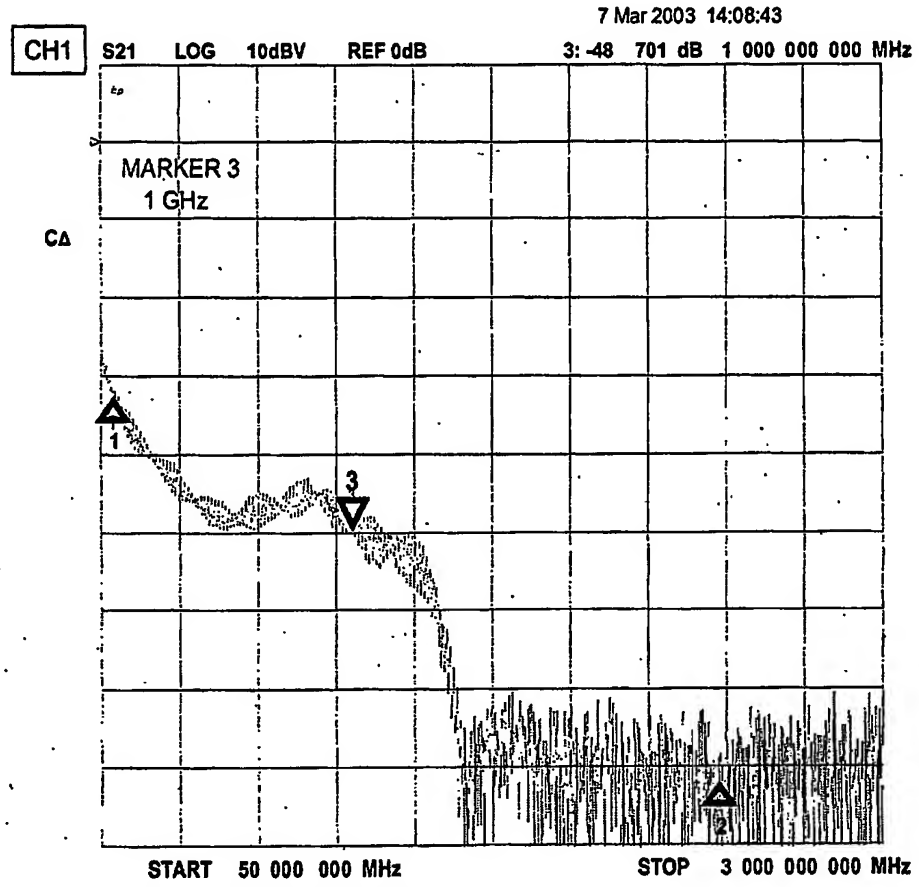
Back Drive Loss vs. Frequency Test 1



CH1 Markers
1: -31 .816 dB
100 000 MHz
2: -62 .863 dB
2. 40000 GHz

Configuration: 60 + 31 + 28 Feet of RG-6 plus 4 "F" barrel connectors
Splitters: "Taiwan", "GC", "Solutions SL559"
Loss at 100MHz= -31.8 dB, Loss at 1GHz = -45.8 dB, Loss at 2.4 GHz = -63.0 dB

Back Drive Loss vs. Frequency Test 2



Configuration: 60 + 31 + 28 Feet of RG-6 plus 4 "F" barrel connectors

Splitters: "Taiwan", "GC", "Channel Master 7244"

Loss at 100MHz= -32.4 dB, Loss at 1GHz = -48.7 dB, Loss at 2.4 GHz = -84.0 dB

RG59 Loss vs. Frequency Testing Summary Table

Test	100MHz	1GHz	2.4GHz
Downstream #1	-13.2	-27.0	-53.5
Downstream #2	-13.8	-29.1	-80.0
Back Drive #1	-31.8	-45.8	-63
Back Drive #2	-32.4	-48.7	-84

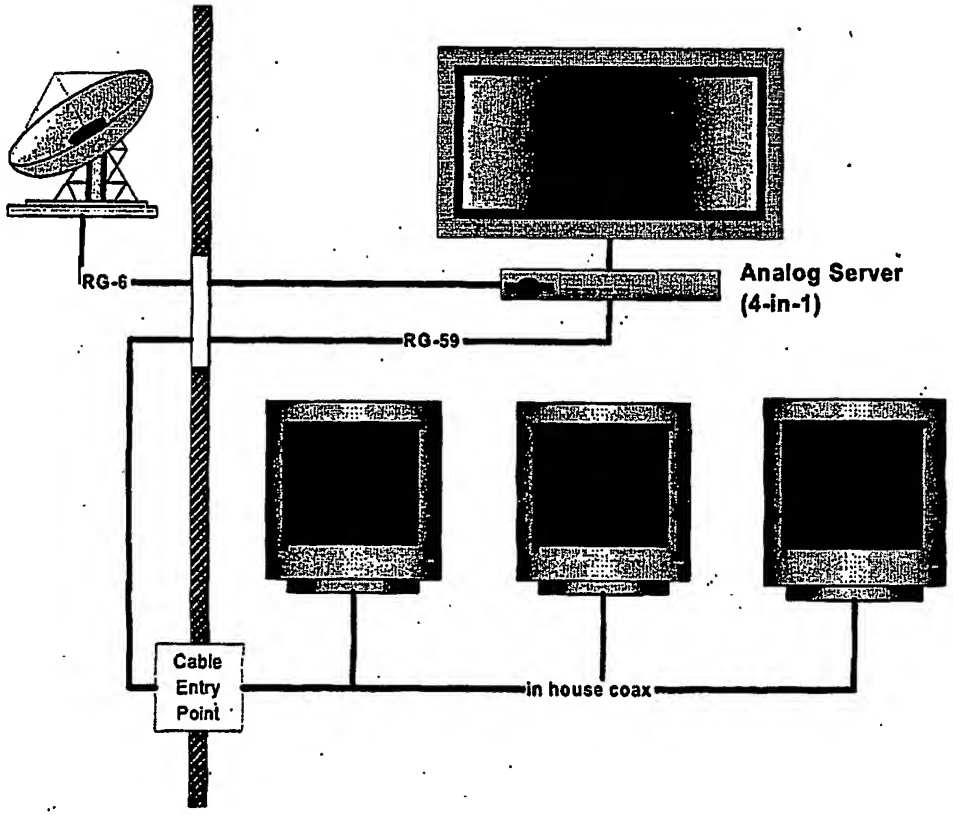
- Test data is for a small sample of splitters; however, some conclusions can be drawn.
  - Downstream video delivery must occur < 1GHz to avoid possible remediation
  - Back driving video delivery is much more difficult at any frequency

In-home RG59 is an excellent choice for down stream video distribut ion

Co-existence Options For MSO Cable Services

- MSO Services Are Completely Disconnected
  - For this case, DIRECTV would have complete access to all frequency spectrum
  - There are no interoperability issues with cable services
- Combination Cable MSO and Satellite Services
  - Cable Data and Satellite Combination
    - DIRECTV video services would share the frequency bandwidth of the RG59
      - Brute Force Approach: Notch out cable video frequency range at entry to house for satellite
      - Possible Legal Issues?
  - Cable Data/Video and Satellite Combination
    - Very difficult to co-exist because no guarantee of available bandwidth. Services will overlap.

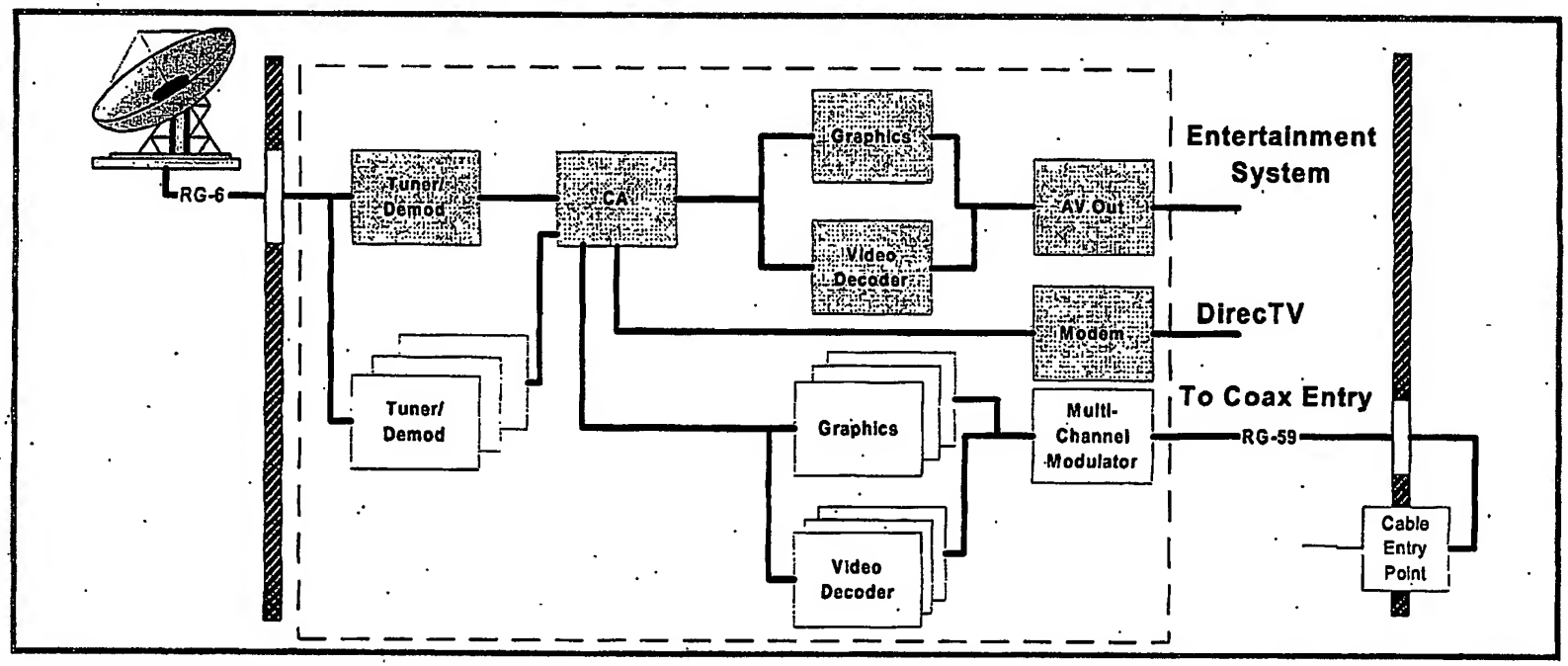
Analog Server (N-in-1) System Architecture



- "N" Tuners, demodulators, demultiplexers, decoders, graphic compositors are centralized in one receiver.
- Provides digital quality for 1 local display and up to 3 unique analog NTSC signals for other room displays
- Analog video signal is placed on open available spectrum on RG59
- SD DVR function is shared throughout the whole house if Main Receiver has HDD

As number of rooms increases, installation and equipment costs a re greatly reduced using an Analog Server

Analog Server (N-in-1) Block Diagram



- Analog video is RF re-modulated onto RG59 coax
- All video/graphics processing is consolidated into receiver
  - Sufficient processing power is needed to run N DIRECTV User Interfaces simultaneously
- Control of User Interfaces from remote TVs is accomplished through wireless RF remotes or IR modulated onto cable plant

N-in-1 receivers can be implemented using current IC technology

N-in1 Summary

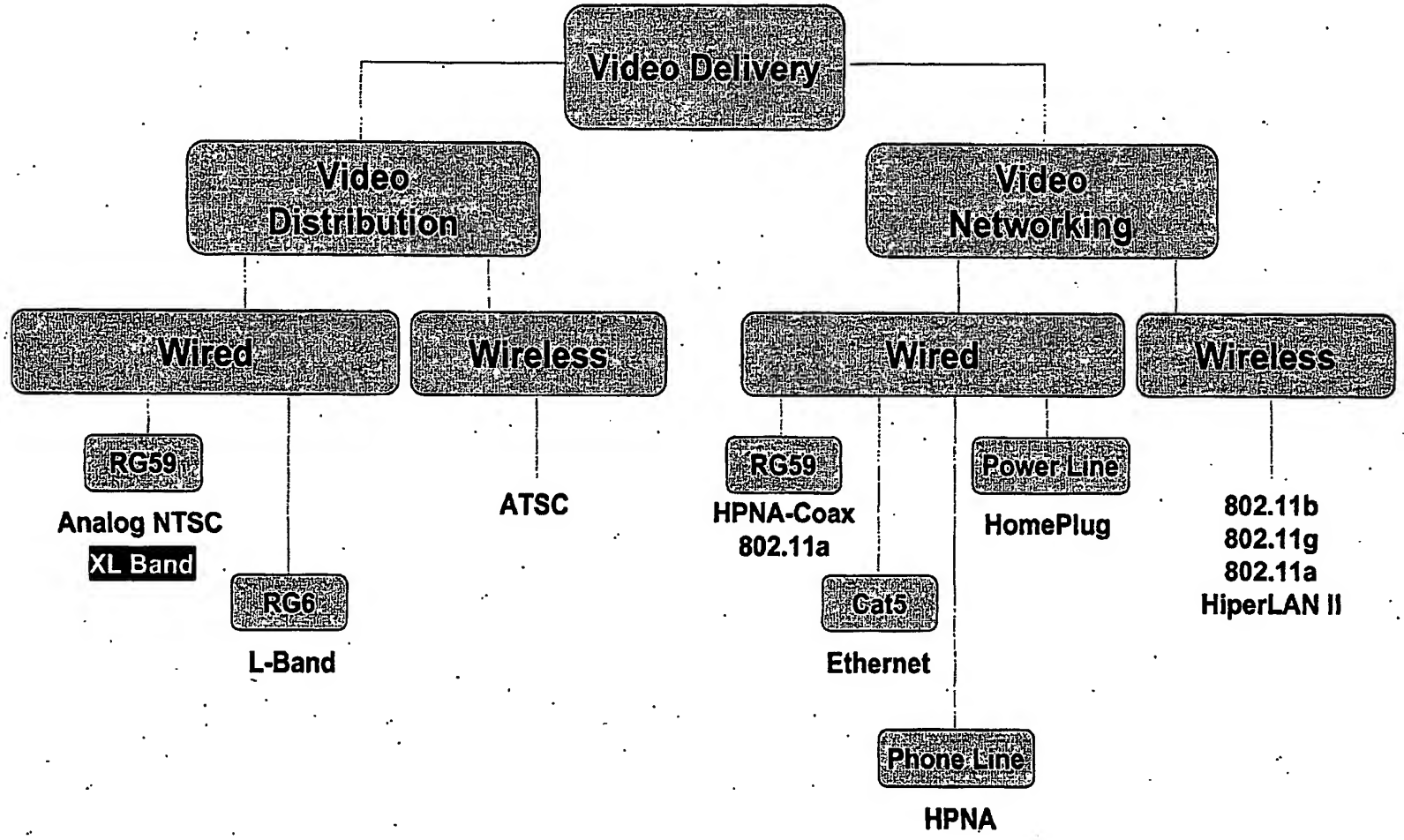
Benefits

- Lower installation cost for homes with an installed base of RG59
- Lower equipment cost
- Shared SD DVR from media server
- Video accessible from any room with installed coax
- Only one modem connection

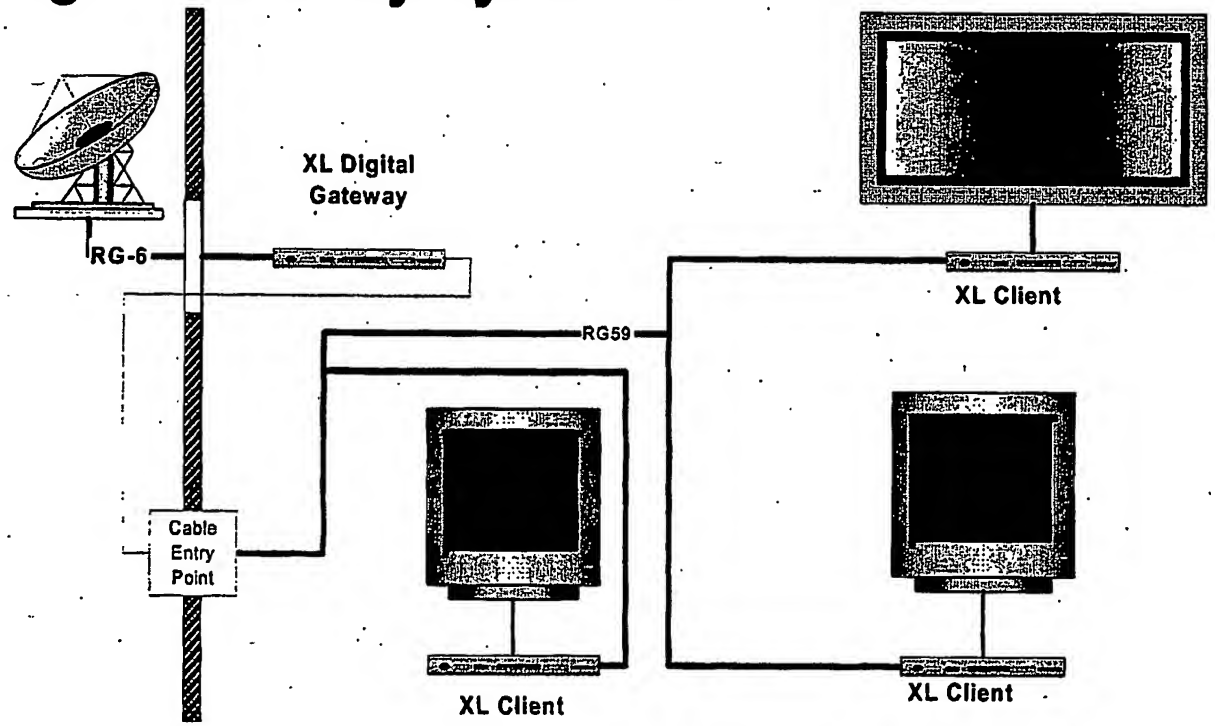
Issues

- Lower quality A/V experience
- Higher entry cost
- Consumer usability – how to keep consumers on the right NTSC video channel
- Rated content issue must be addressed for non-Vchip TVs
- Co-existence with cable services

Video Distribution: Wired: RG59: XL Band



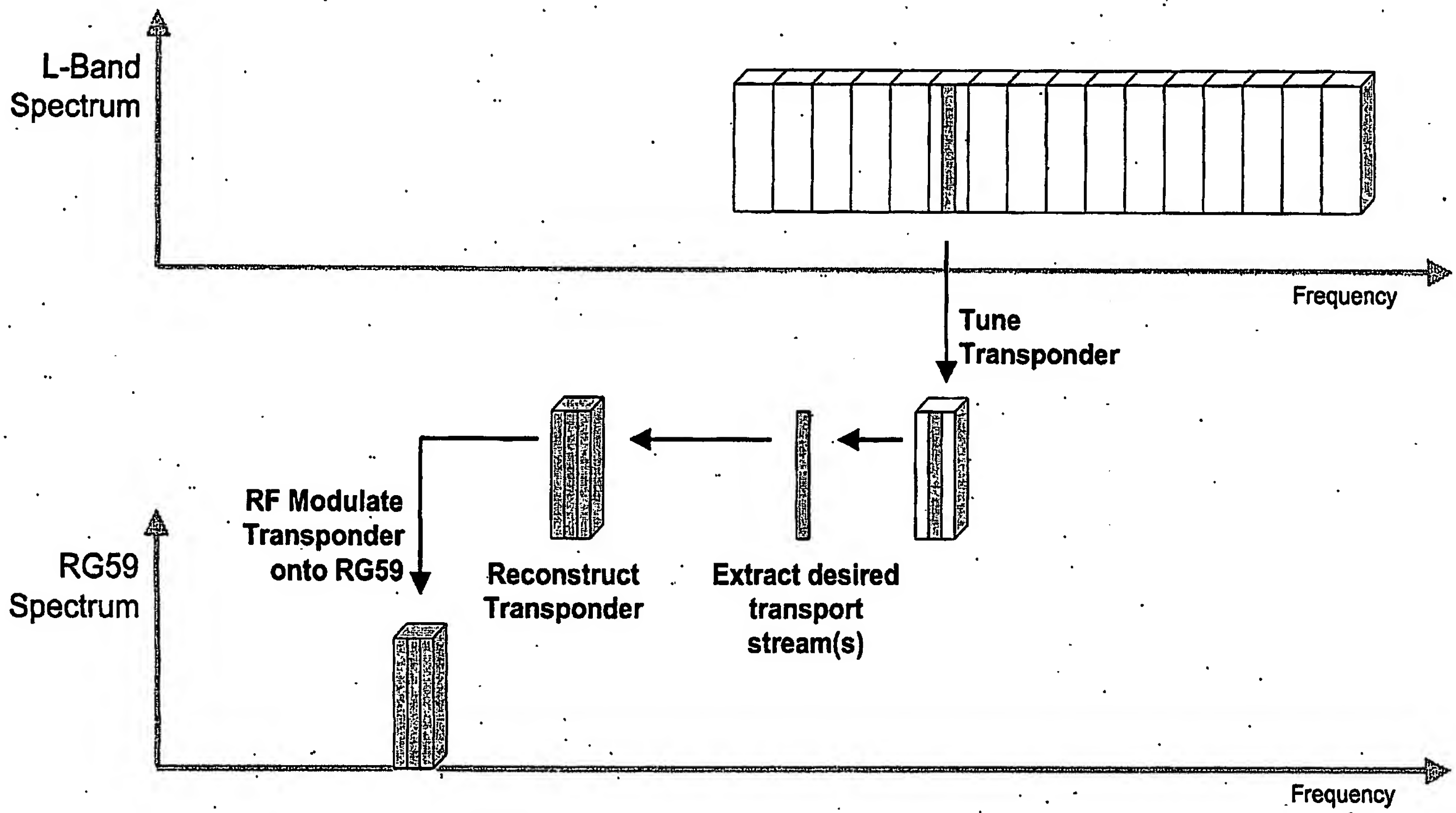
XL Digital Gateway System Architecture



- Concept: Use a gateway device to convert L-Band distribution to RG59 distribution
- To use RG59, transponders must be processed so that transport streams can be carried at frequencies less than 1GHz
- As number of rooms increase, installation savings increase

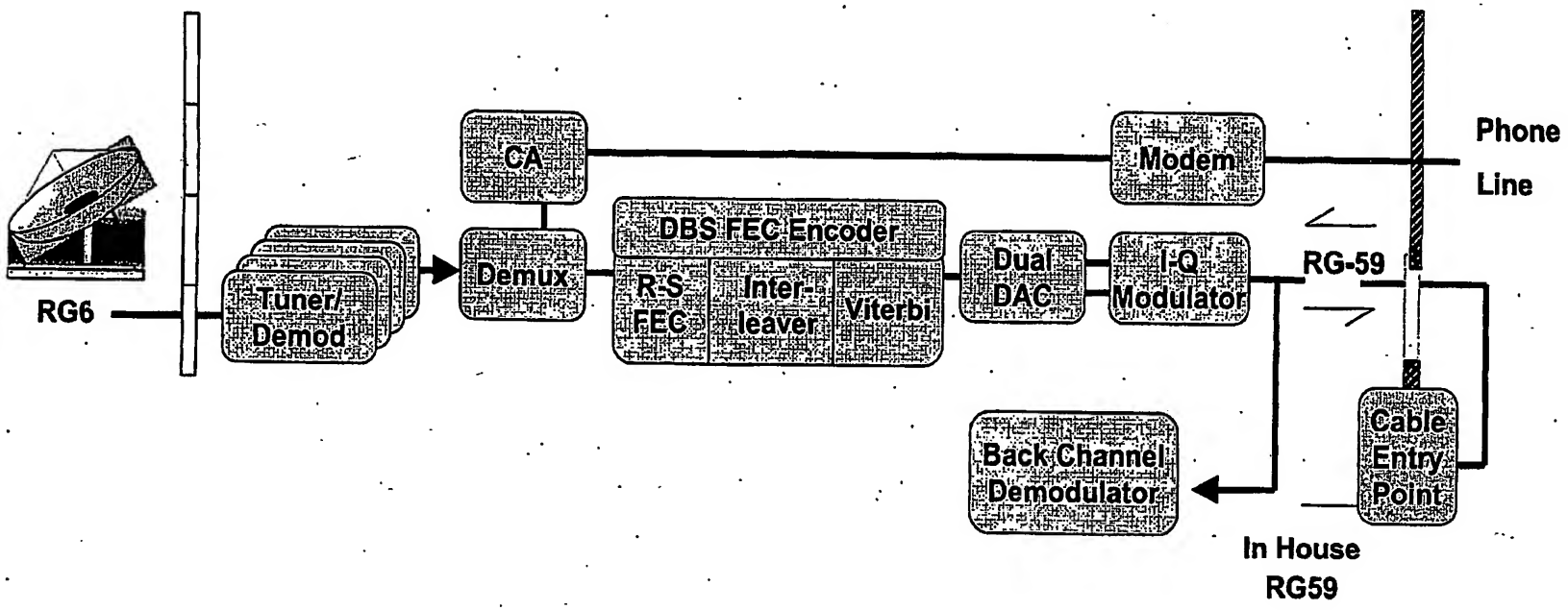
XL Band allows digital video distribution over legacy coax

XL Band Transport Remodulation



XL Band allows DIRECTV video to be carried over in-house coax

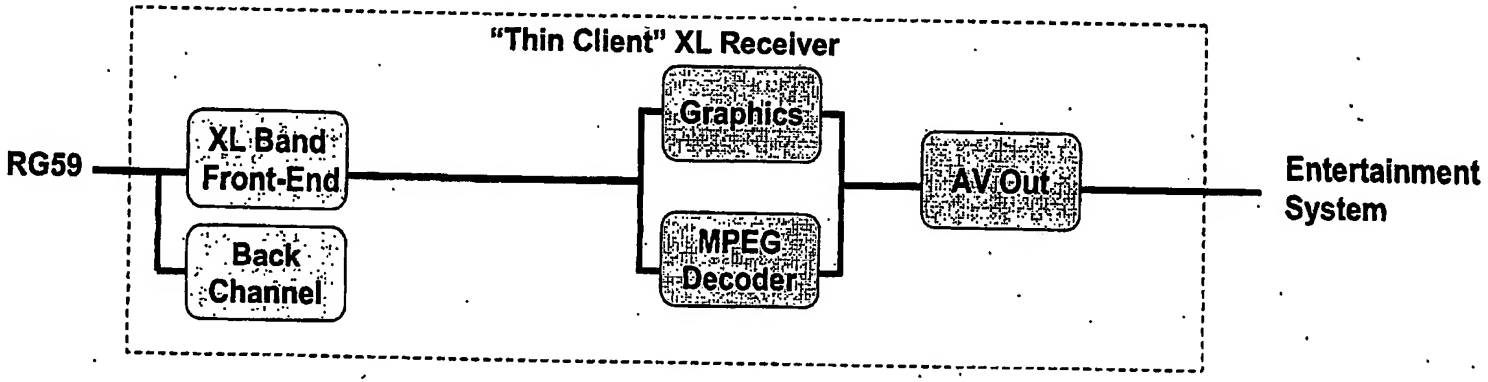
XL Digital Gateway Block Diagram



- Up to 4 transponders are tuned, demodulated, and demultiplexed into desired transport streams
- XL Digital Gateway re-multiplexes the transports into a new "transponder"
- An XL client controls the tuning process by communicating a small amount of information over a back channel to the XL Digital Gateway

XL Digital Gateway technology can migrate towards the ODU

XL Client Block Diagram



- Current receiver Front-End technology (tuner/demod) must be adapted for XL Band Technology
  - Extended tuning range below 860MHz
  - Equalization must be used to handle RG59 impairments
- To receive a program
  - XL Client sends message to gateway requesting specific transponder/transport
  - Gateway extracts information and creates a RG59 based "transponder"
  - Receiver tunes to transponder frequency established by gateway
- Back Channel technology must be investigated/selected (wired and/or wireless)

XL Client provides potential for customer install of 2nd, 3rd, 4th rooms

XL Digital Gateway Summary

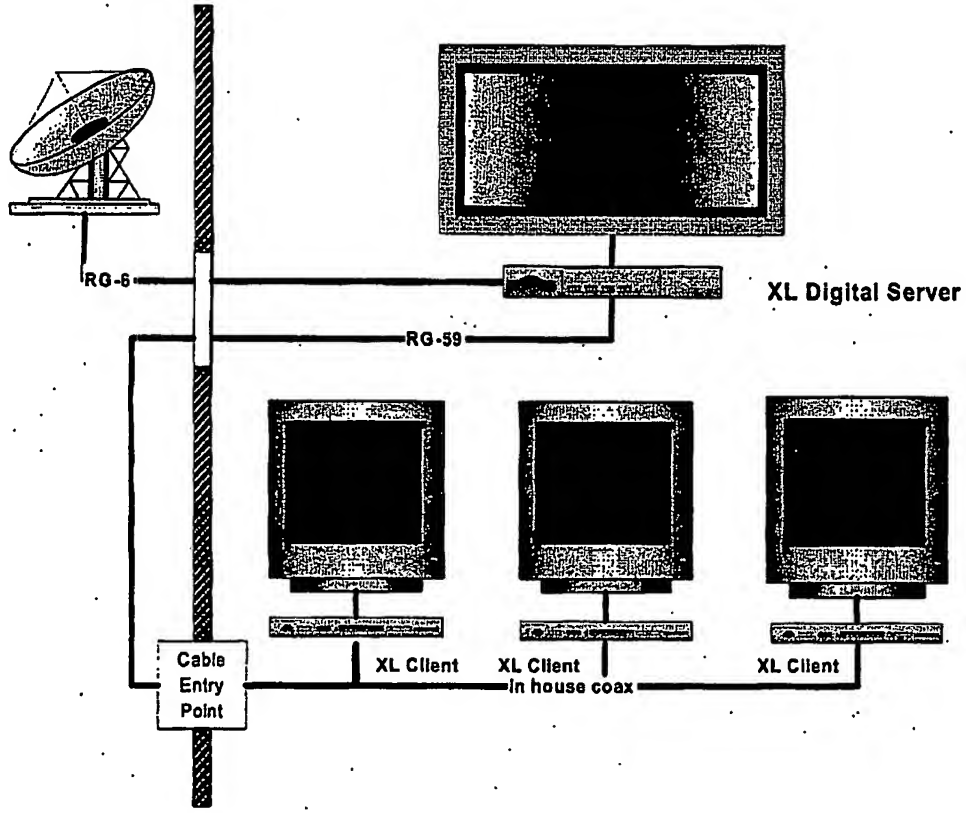
Benefits

- Digital A/V is accessible from any room with installed coax.
- CA, Modem call back, LNB power, etc. are consolidated into one piece of equipment
- As rooms served increase, installation costs decrease.
- Customer self-install model for 2nd, 3rd, and 4th boxes

Issues

- Technology (downstream and upstream) is under development/investigation.
- Overall equipment costs are still relatively high
- Co-existence problems with cable services

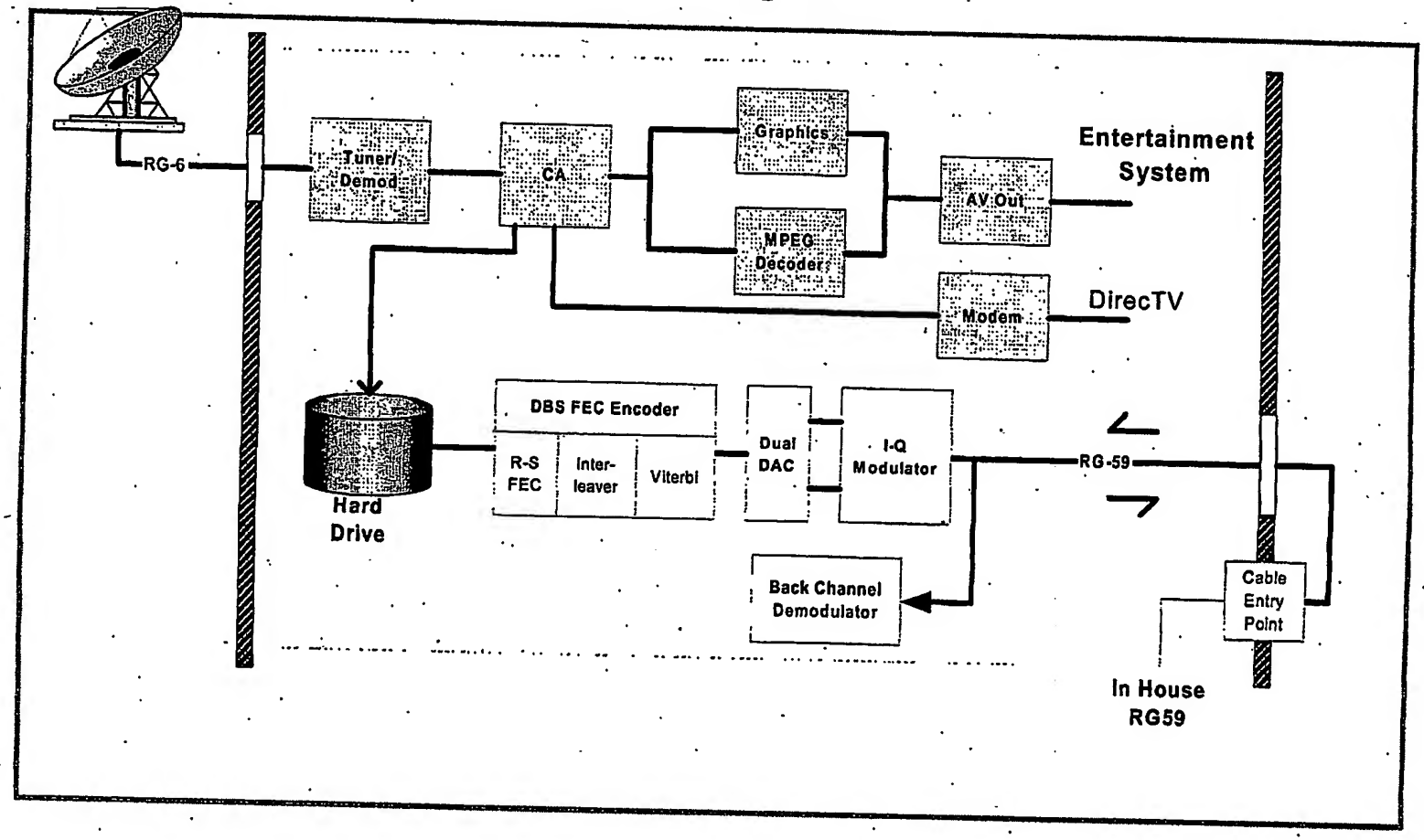
XL Digital Server System Architecture



- Up to 4 transponders are tuned, demodulated, and demultiplexed into desired transport streams
- XL Digital Server re-multiplexes three transports into a new "transponder", which is placed onto in-house coax.
- An XL client controls the tuning process by communicating a small amount of information over a back channel to the XL Digital Server.

XL Digital Server provides an all digital distribution mechanism for RG59

XL Digital Server Block Diagram



Key technology is to re-multiplex transport streams into a new "transponder"

XL Digital Server Summary

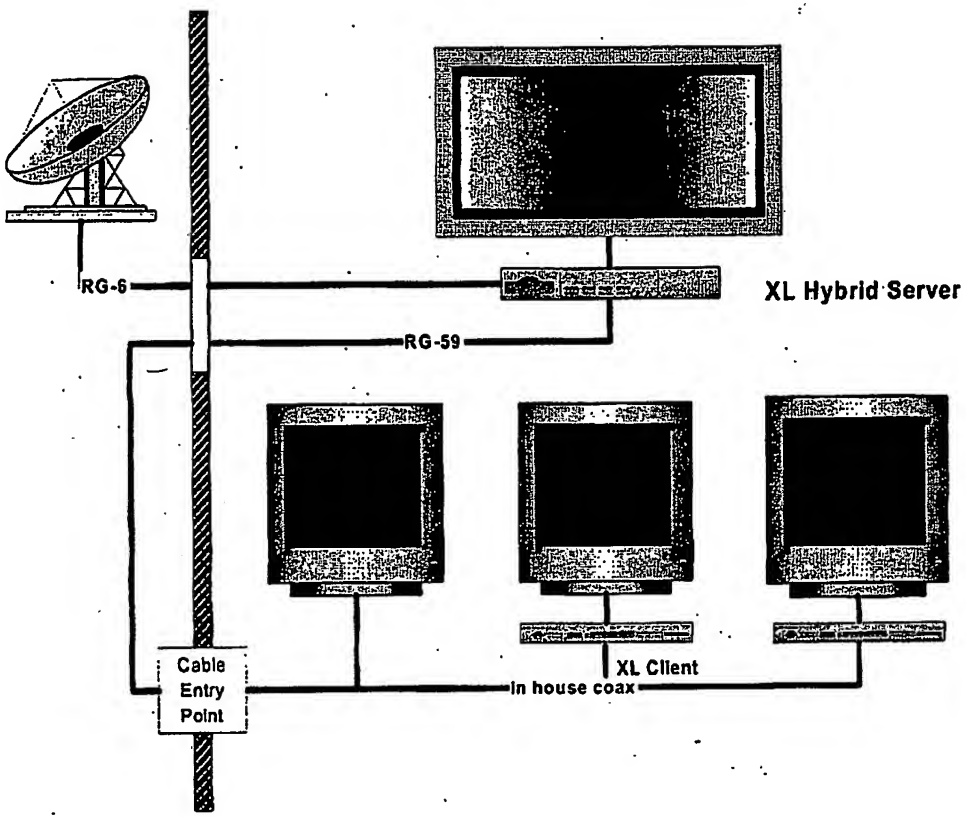
Benefits

- Superset of XL Gateway Features/Benefits
- Adds local video decode is provided by XL Digital Server
- Equipment costs are slightly lower than for Gateway model because of integration of two devices into one.

Issues

- Technology (downstream and upstream) is under development/investigation.
- Co-existence problems with cable services

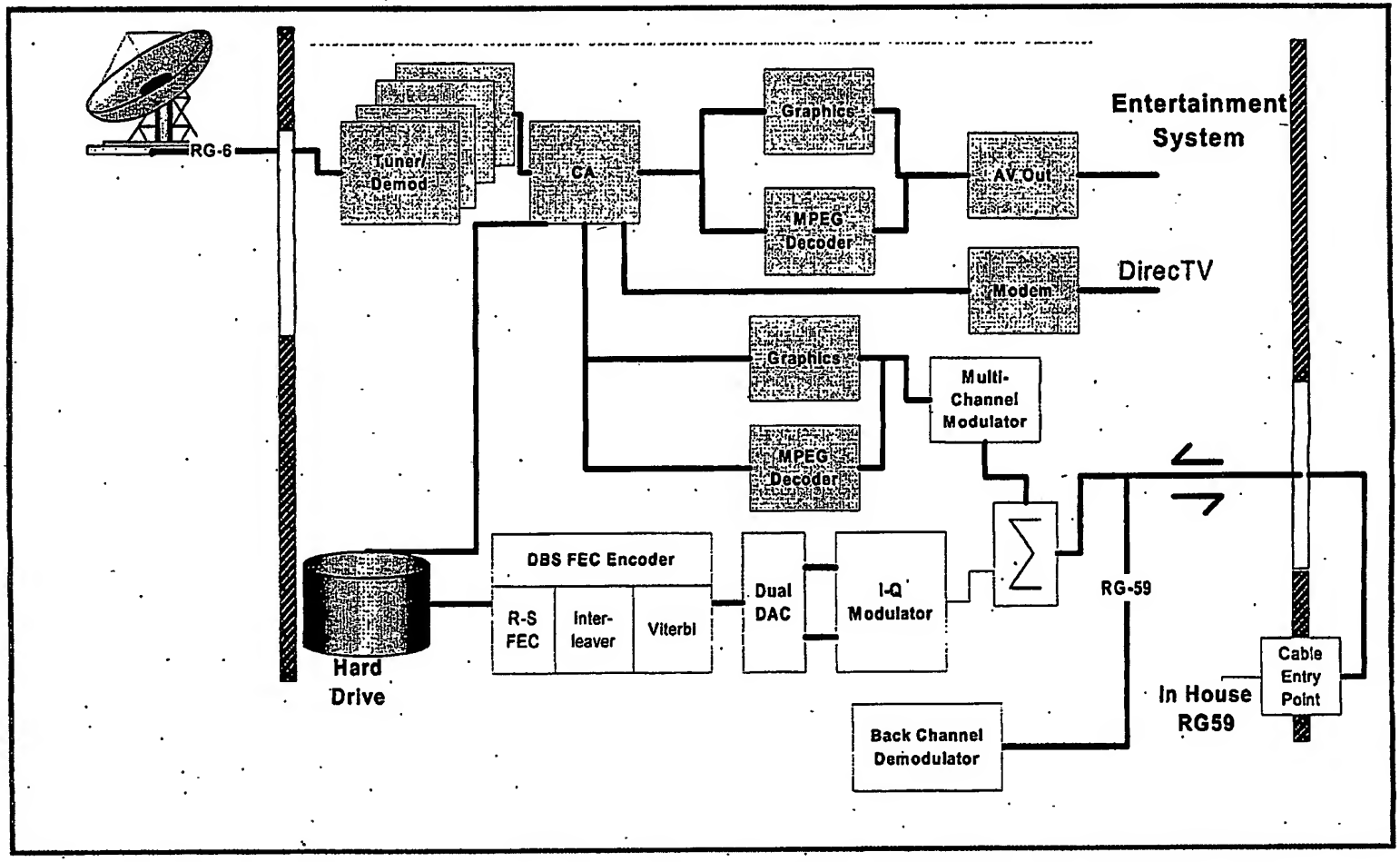
XL Hybrid Server



- 2 full video decode paths (1 local, 1 remote analog)
- 2 XL Band channels for digital video distribution
- Analog video and XL Band signals are placed onto in home RG59
- If HDD exists at the server, SD DVR function is shared for analog delivery and SD/HD DVR is shared to digital clients

The XL Hybrid Server provides a full range of analog and digital video distribution for whole-house solutions.

XL Hybrid Server Block Diagram



XL Hybrid Server provides 1 local SD/HD Digital Video, 1 analog RF, and 2 XL Band digital videos

XL Hybrid Server Summary

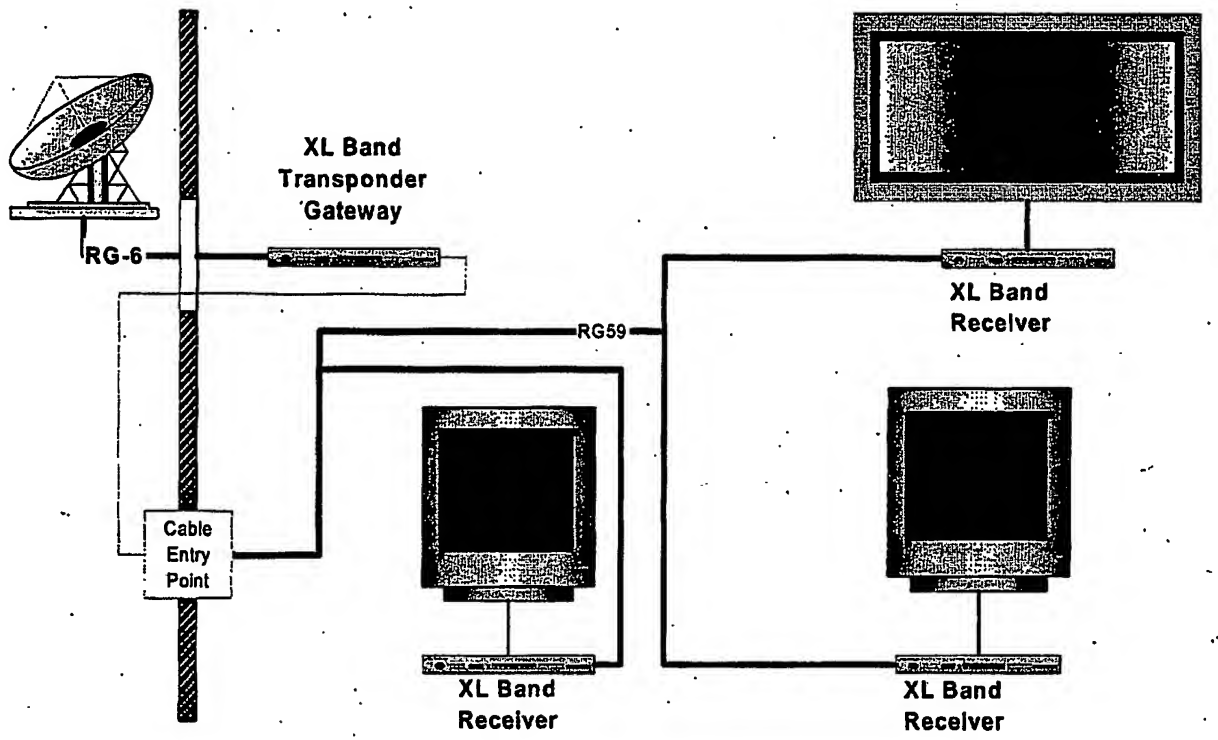
Benefits

- Good cost performance because a receiver and installation costs are saved
- Analog video is distributed over in-home coax
- Digital option for 3rd and 4th rooms
- Maintains local video decode is provided by XL Digital Server
- CA, Modem call back, LNB power, etc. are consolidated into one piece of equipment

Issues

- Technology (downstream and upstream) is under development/investigation.
- Co-existence problems with cable services

XL Band Transponder Gateway System Architecture

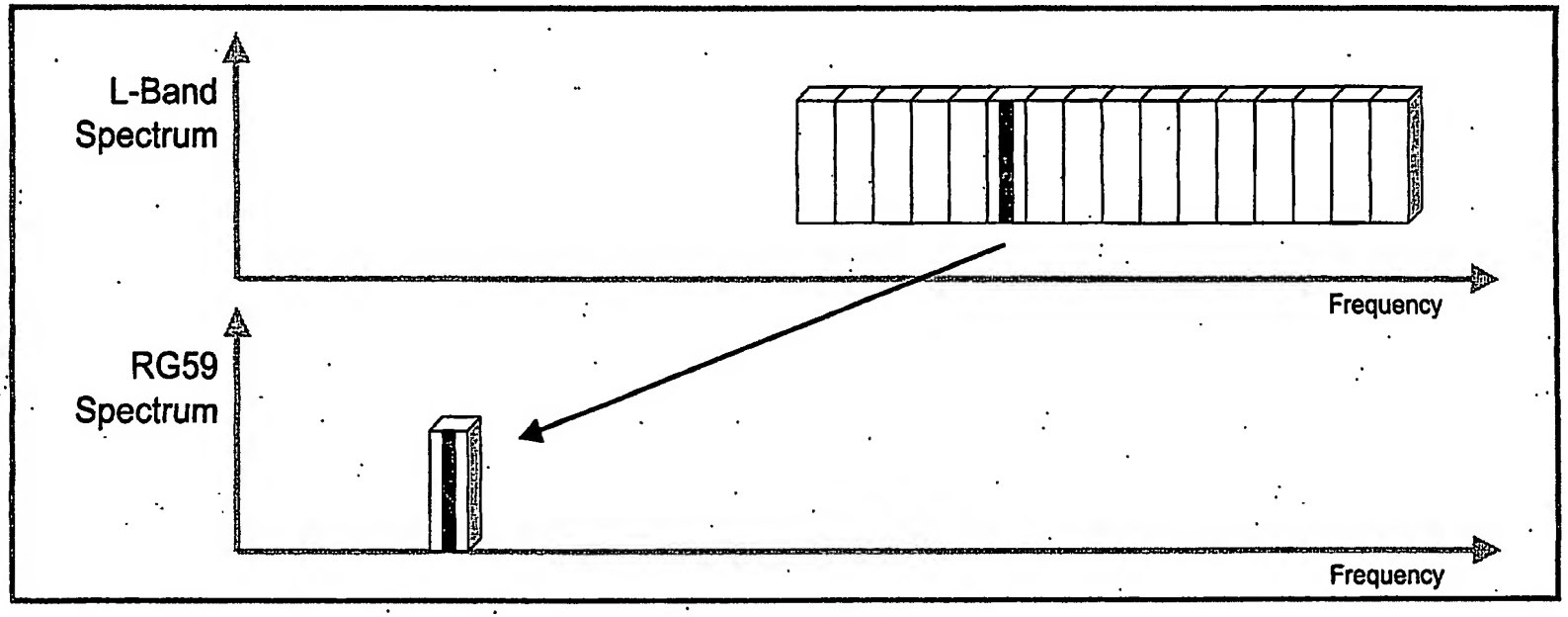


XL Band allows digital receivers to operate with installed RG59 base

Other Modulation Approaches

- QAM
  - Rather than creating a new "transponder" for digital video distribution within the house, the XL Clients could use a QAM front end
    - Designed to work across RG59 impairments
    - Available sooner
    - But more expensive front end
- 8VSB
  - Thomson has considerable 8VSB technology that could be used as the front end to the XL Client
    - Designed to work in extremely harsh environments
    - Cost effective approach to XL distribution
- XL Band Transponder Frequency Shifting
  - (see next page)

XL Band Satellite Transponder Frequency Shift

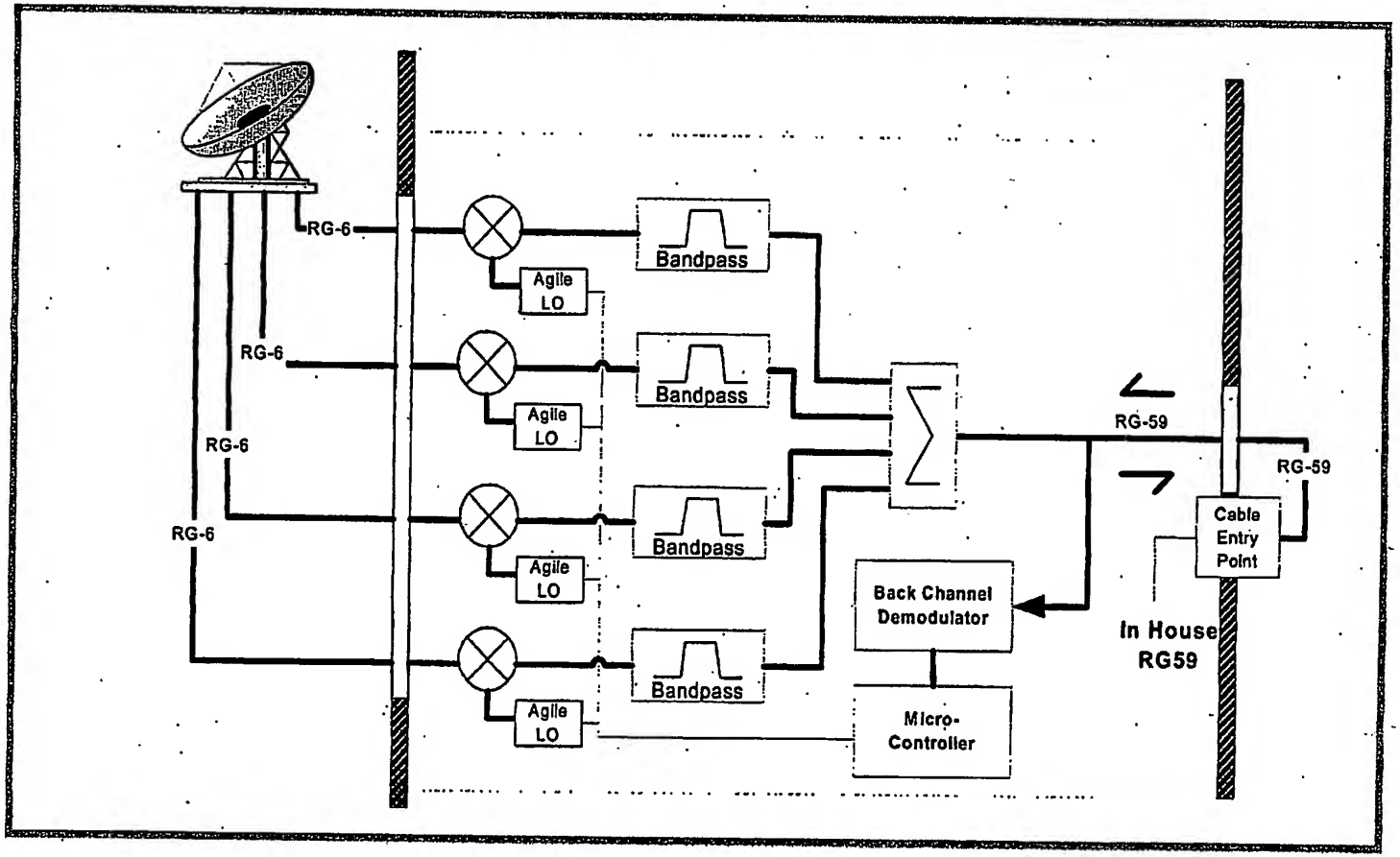


Concept

- Tune to desired satellite transponder
- Frequency shift desired transponder down to frequencies that can be carried safely on installed RG59 (< 860, < 450)

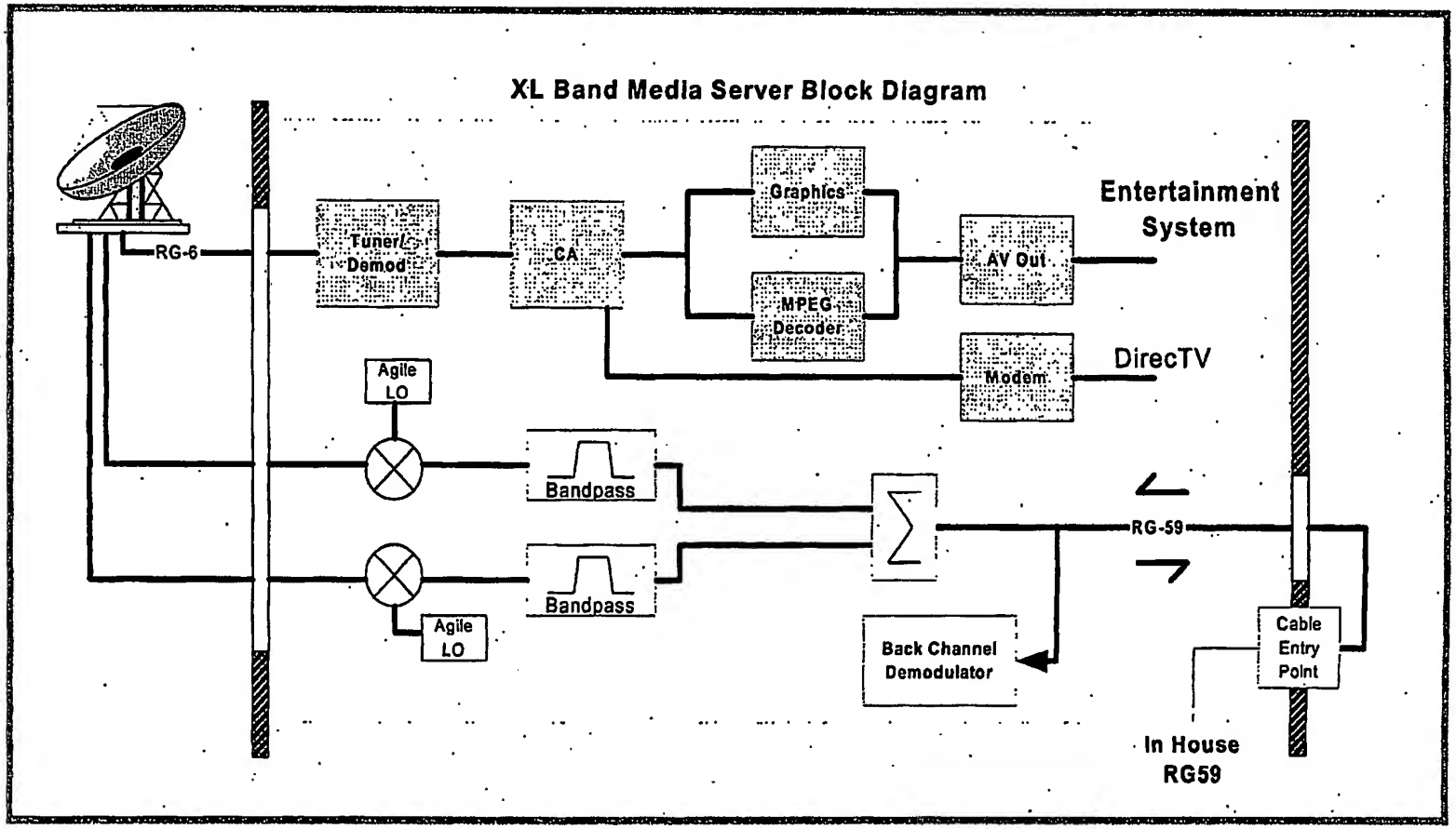
Multiple transponders can be frequency shifted to allow for multiple receivers

XL Band Transponder Gateway Block Diagram



XL Band Transponder Gateway is fairly simple and low cost

XL Band Transponder Server Block Diagram



1 local SD/HD Digital Video and 2 XL Band Transponders

Differences in XL Band Approaches

Item	XL Band Transport	XL Band Transponder Frequency Shift
Timing	3Q2004	1Q2004
SD/HD Digital DVR sharing	Yes	No

- XL Transport
  - Allows sharing of SD/HD Digital DVR content from the Gateway/Server to any XL client device
- XL Transponder Frequency Shift
  - Can be implemented sooner but sacrifices shared DVR functionality
  - Provides a potential evolution for ODU technology today

Video Distribution Systems Summary

Solutions Overview	Basic Hardware Platform					LNB In	XL Band	
	Tuners	Decode	Mod	CAM	Modem		In	Out
Base Receiver	1	1	1	1	1	Yes	No	No
2-in-1	2	2	2	1	1	Yes	No	No
4-in-1	4	4	4	1	1	Yes	No	No
XL Digital Gateway	4	0	0	1	1	Yes	No	Yes
XL Digital Server	4	1	1	1	1	Yes	No	Yes
XL Hybrid Server	4	2	4	1	1	Yes	No	Yes
XL Client	1	1	1	0	0	No	Yes	No

- All servers and gateways consolidate CA, modem, LNB interface into one location (other configurations are available)
- Analog server solutions consolidate all tuners into one location
- XL Digital solutions add
  - Ability to distribute digital video
  - Low speed back channel communication for control

Both analog and digital solutions are available for in-house coax

Video Distribution Capabilities Summary

Solutions Overview	1st Room	2nd Room	3rd-4th Room	Shared SD DVR	Shared HD DVR
Base Receiver	Local	No	No	No	No
2-in-1	Local	Analog	No	Analog	No
4-in-1	Local	Analog	Analog	Analog	No
XL Digital Gateway	Digital	Digital	Digital	Digital	Digital
XL Digital Server	Local	Digital	Digital	Digital	Digital
XL Hybrid Server	Local	Both	Digital	Both	Digital
XL Client	Local	n/a	n/a	n/a	n/a

- 2-in1 and 4-in-1 are pure analog systems for 2nd-4th rooms
  - SD DVR is shared using analog NTSC
- XL Digital receivers provide a pure digital solution to all rooms
  - SD/HD DVR is shared to all XL clients
- XL Hybrid server melds analog and XL digital traits

RG59 based architectures provide wide selection of viable soluti ons

Video Distribution Summary

- To lower installation costs, DIRECTV should exploit the large base of existing in-home RG59 wiring.
- To lower equipment costs in the near term (4Q2003-1Q2004), DIRECTV should consider the "N-in-1" Analog Server architecture.
- For digital video distribution, DIRECTV should consider one or more applications of XL Band (available 3Q2004).
- Using RG59, SD DVR can be shared using analog NTSC video, and SD/HD DVR can be shared using XL Band distribution.